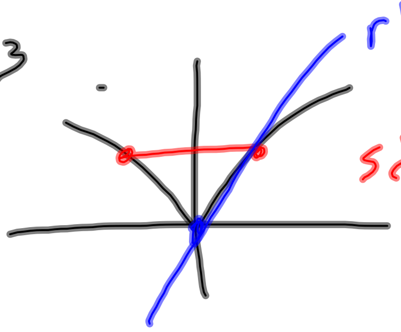
23



$rhdq = 10 \quad (h = .001)$

$sdq = 0$

$\text{nDerivative}(x^{2/3}, x=0)$

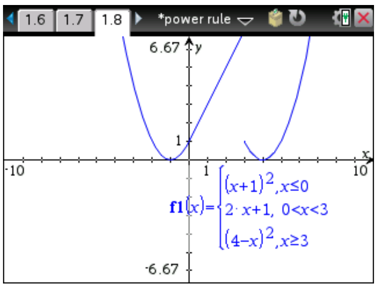
undef

$sdq = \text{centralDiff}(x^{2/3}, x=0, .001)$

Sep 17-10:09 AM

35.

$$f(x) = \begin{cases} (x+1)^2 & x \le 0 \\ (2x+1) & 0 < x < 3 \\ (4-x)^2 & x \ge 3 \end{cases}$$



not differentiable at $x=3$ because $f(x)$ is not continuous

at $x=0$? Yes

same slope
$\frac{d}{dx}(x+1)^2 \,|\, x=0 \quad 2$
$\frac{d}{dx}(2x+1) \,|\, x=0 \quad 2$

l der = r der

$f(x)$ continuous
$(x+1)^2 \,|\, x=0 \quad 1$
$(2x+1) \,|\, x=0 \quad 1$

diff at all reals except $x=3$

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39. $f(x)=\begin{cases}3-x & x<1\\ ax^2+bx & x\ge 1\end{cases}$

a) continuous

$$\lim_{x\to c} f(x) = f(c)$$

lhl $\lim_{x\to 1^-} 3-x = 2$

rhl $\lim_{x\to 1^+} ax^2+bx = a+b$

$\boxed{2=a+b}$

b) differentiable

$-1 = 2ax+b \mid x=1$

$\boxed{-1=2a+b}$

$-(a+b=2)$

$2a+b=-1$

$a=-3$

$b=5$

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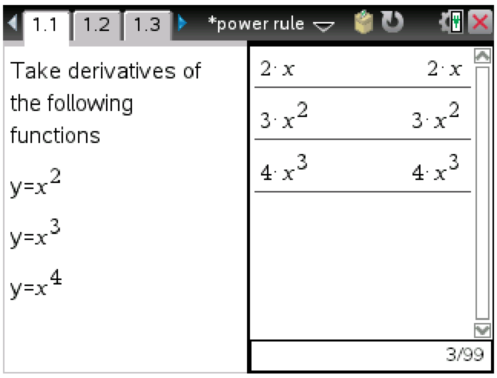
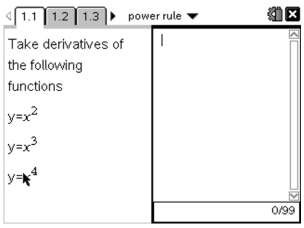
3.3a Rules for Differentiation

Use Power Rule.tns to discover the power rule for derivatives

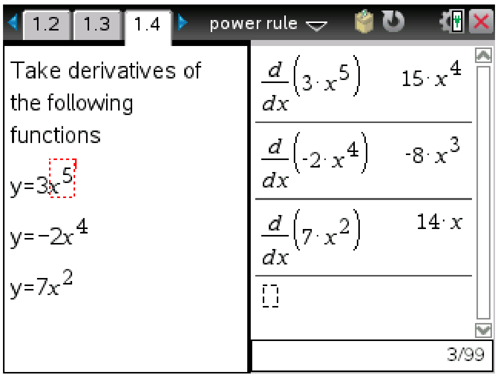




$\frac{d}{dx} x^5 = 5x^4$

$$\boxed{\frac{d}{dx} x^n = n x^{n-1} \quad \text{power rule}}$$

Sep 11-9:07 PM



$$\frac{d}{dx}\, c\cdot x^n = n\cdot c\, x^{n-1}$$

c is a constant

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Proof of the power rule

Sep 11-9:45 PM

Find $\frac{dy}{dx}$ if $y = x^3 + 6x^2 - \frac{5}{3}x + 16 \cdot x^0$

$$\frac{dy}{dx} = 3x^2 + 12x - \frac{5}{3}$$

Sep 11-9:45 PM

Find the horizontal tangents of $y = x^4 - 2x^2 + 2$

slope = derivative

by hand

slope = 0

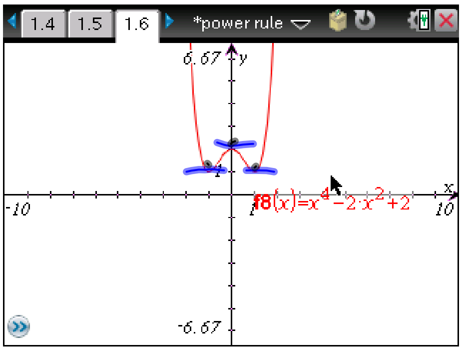
$$y' = 4x^3 - 4x = 0$$

$$4x(x^2 - 1) = 0$$

$$x = 0, 1, -1$$

$$\boxed{\begin{array}{l} y = 2 \\ y = 1 \end{array}}$$

with the calculator



Sep 11-9:56 PM

higher order derivatives

$y = x^3$

$y' = 3x^2$

$y'' = 6x = \frac{d^2y}{dx^2}$ 2^{nd} derivative

$y''' = 6$ $\frac{1}{x} = x^{-1}$

$y^4 = 0$

Sep 11-10:02 PM